USDA FOREST SERVICE

Research Note NC-203

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE — U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55108

1976

WEED CONTROL IN BLACK WALNUT PLANTATIONS

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ABSTRACT.--Weeds must be controlled for at least 3 years to successfully establish walnut plantations. Whether by cultivating or applying chemicals, a strip or spot 4 feet wide is sufficient the first 2 years, followed by a 6-foot spot or strip for the third and fourth years.

OXFORD: 236.1:176.1 (*Juglans nigra*). KEY WORDS: herbicides, cultivation, *Juglans nigra*, ground preparation, chemical.

Weed control in walnut plantations is now considered standard operating procedure. Landowners and plantation managers who ignore or try to shortcut this important step soon discover that in a race with the weeds for moisture, nutrients, and light, walnut trees seldom win. The type and amount of weed control depends on whether the site is a field or cut-over forest, the other cultural operations planned, and the owners' objectives.

MECHANICAL VERSUS CHEMICAL CONTROL

Cultivation and/or chemicals can be used successfully to control weeds in walnut plantations. Mechanical control is more costly, but if the landowner has a tractor and cultivator, this may be the best alternative. To keep weeds from getting taller than 6 inches, three to six cultivations per year are necessary. A disc or rototiller can be used, but be careful not to damage the stems and shallow feeder roots.

Mowing does little to reduce the competition for moisture and nutrients and so is not a substitute for cultivation or chemical weed control. When weeds are controlled in strips or around individual trees, tall grass and weeds between the rows can protect walnut trees from wind (Schneider *et al.* 1968). On the other hand, however, mowing may be helpful by making it easier to walk through the plantation for other cultural operations and by reducing the fire hazard by keeping the vegetation on the ground.

Mulching with plastic, sawdust, bark and wood chips can control weeds, but these materials have some disadvantages. Plastic is expensive, takes a lot of time to install, may cause heat girdling damage, and provides cover for mice that girdle small trees. Wood chips, sawdust, and bark also take a long time to apply and may tie up soil nitrogen adversely affecting the trees. Trees usually grow slower when mulched than when cultivated or chemically treated (Bey *et al.* 1976, Erdmann 1967, von Althen 1971).

Herbicides have been used successfully for weed control in walnut plantations. However, herbicides can be used only if it so specifies on the container label and is

not limited by a State or Federal regulation.[1] Don't assume from general statements on the label that the herbicide may be used indiscriminantly. For example, some chemicals designated as weed killers and/or soil sterilants may kill your walnut trees, too. If you have any doubt about proper use, check with an herbicide authority before proceeding.

Simazine is registered for weed control in walnut plantations that have been established 1 year or more. It is a pre-emergent chemical that acts primarily on germinating seeds. Rates of 4 pounds per acre are recommended for sandy-loam soils and 5 pounds per acre for the heavier clay-loam soils. Simazine is partially effective in killing established grasses but not woody perennials such as trumpet vine. Grasses are easily killed by dalapon at a rate of 5 to 10 pounds per acre. At present, dalapon is not registered for use in walnut plantations, but Dow Chemical Company[2] is considering a label change to include dalapon for use in walnut plantations. Phenoxy chemicals such as 2,4-D will kill a variety of annual and biennial broadleaf weeds. However, if sprayed on the leaves or injected into the trunk, they will also kill trees. Although these chemicals are registered for use on weeds in golf courses, parks, and cemeteries, the container labels for these chemicals do not say "walnut plantations" *per se*.

SOD VERSUS PREPLANT TILLING

Although plowing and discing before planting are not necessary for successful plantation establishment, trees planted in plots prepared by plowing or discing will eventually outgrow those planted in sod. (fig. 1). In our studies the differences between sod and plowed plots did not show up until the third or later years. Jaciw (1974) also reports better performance of young walnut trees planted on cultivated rather than sod plots.

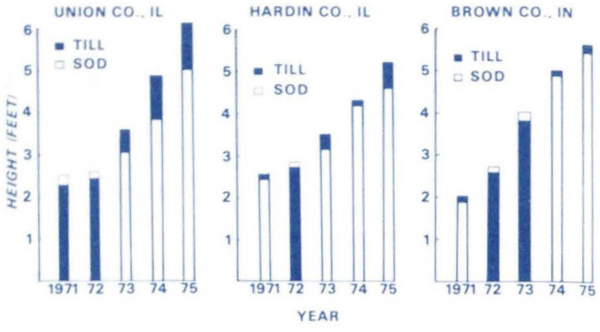

Figure 1.--*After 5 years, height growth of walnut trees was greater in plots that were tilled before planting than in plots where trees were planted in sod.*

One effect of plowing grassy fields before planting is the conversion of the ground vegetation to predominantly broadleaf weeds. Simazine works effectively on germinating weed seeds, so weed control with simazine is more complete on areas prepared by plowing than on established sod (Erdmann 1967). On the other hand, plowing may encourage the development of trumpet vine, a weed that can be troublesome in plantations for 10 years.

COMPLETE VERSUS PARTIAL CONTROL

It is not necessary to control weeds over the entire area for maximum growth of walnut trees. Treating spots or strips is cheaper than complete control and reduces the chances of erosion. Even on very gentle slopes, erosion can become severe where there is complete weed control over the entire plantation.

The spot diameter or strip width need not be wider than 4 feet for the first 2 years and 6 feet for the third and fourth years. In studies in southern Illinois and Indiana, there were few differences among spot sizes after 2 years. During the third and later years there appears to be some

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[1] *This publication reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.*

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

[2] *Mention of trade names does not constitute endorsement of the products by the USDA Forest Service.*

advantage to increasing the size of the weed control spot beyond 4 feet in diameter (fig. 2). The trees in the 4-, 6-, and 8-foot diameter treatments grew larger than those in the control and 2-foot spots. This and other studies suggest that as we continue weed control beyond the first few years the width of the weed control strip should be increased for maximum growth.

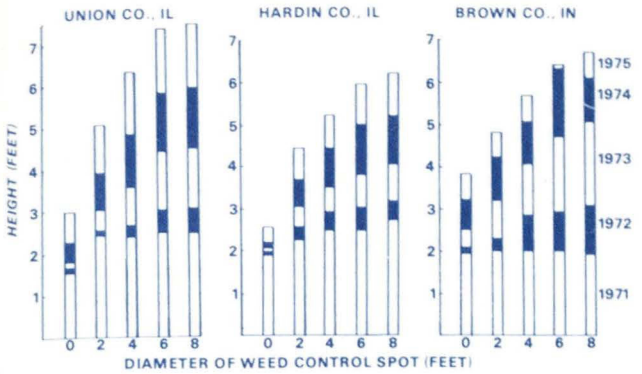

Figure 2.--*During the third and later years, height growth of walnut trees can be increased by controlling weeds in spots greater than 4 feet in diameter.*

In another experiment in southern Illinois, we controlled weeds for the first 7 years with chemicals (simazine + dalapon + 2,4-D amine) in strips 4 to 20 feet wide, plus a control. No weed control was done during the eighth year. For the first 4 years, there was no gain in height made by spraying in strips wider than 4 feet. Then during the last 4 years, the trees in the wider strips grew taller and larger in diameter than those in the narrow strips (fig. 3).

Whether or not to spray spots larger or strips wider than 4 feet is uncertain at this time. For spraying spots in a plantation with a 12- by 12-foot spacing, and using simazine at 5 pounds per acre, costing $3.50/lb, the cost of the chemical per acre would be as follows:

Spot diameter (feet)	*Cost of simazine/acre*
4	$ 1.53
6	3.43
8	6.10
10	9.54
12	13.73

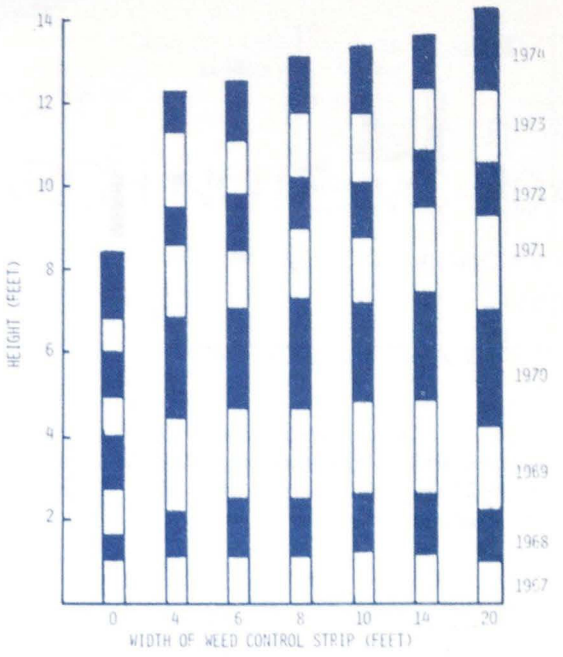

Figure 3.--*In an experiment in southern Illinois, trees with weed control in strips wider than 4 feet grew larger than those in narrower strips.*

We feel that if spraying is continued for more than 2 years, spot size should be increased to 6 to 8 feet in diameter. The additional cost of materials would be minor compared to the expected return. To go from 4- to 8-foot spots would mean an additional cost of less than $5/acre for chemicals plus a small amount for additional labor. The additional chemical cost compounded for 40 years at 10 percent will amount to about $225, but probably less than the increased value due to the additional weed control.

1, 2, 3 OR MORE YEARS OF CONTROL

Weeds should be controlled for at least 3 years in black walnut plantations for maximum growth. In experiments in Indiana and Iowa, we compared three weed control treatments (simazine, atrazine, and cultivation) for 1, 2, and 3 years. In both States, tree growth was greater when weeds were controlled for 3 years than for 2, and for 2 years than for 1 (fig. 4). The differences in growth due to treatment varied by State and may be partially explained by the intensity of the cultivation received. In Iowa no weeds were allowed to grow in the cultivated plots,

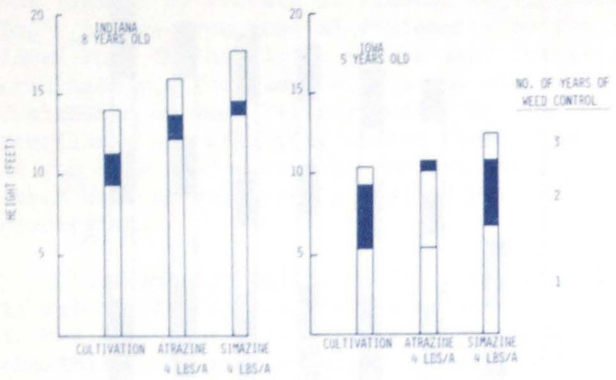

Figure 4.--*In two plantations, walnut growth was generally greater when weeds were controlled for 3 years than for 2, and for 2 years than for 1.*

while in Indiana the plots were not cultivated until the weeds were quite dense.

By controlling weeds in wide strips or spots during the fourth and later years, we believe that we will get faster tree growth. Yet, the answer to the question of whether or not it is worth the extra cost is not clear. Costs for chemical weed control probably will not exceed $25/acre at current prices. To get a 10 percent return on the $25 over the next 40 years, we need to receive an increase of $1,131/acre due to the additional weed control. It is questionable if weed control beyond 3 years is an economically sound practice. From the biological standpoint, it seems reasonable that we should continue weed control until the crown is large enough to shade out some of the competing weeds. On good sites and at a 10- by 10-foot spacing, crowns will begin overlapping at about age 5. Weed control should be continued for at least 3 years, but not longer than when crowns begin to close and shade out competing weeds.

DISCUSSION

People plant walnut trees for many different reasons, and the weed control practice that is best for one grower may not be suitable for another. For some, mowing may increase the value simply by making it easier to walk through the plantation, while for others this may not be important. Other interacting factors that influence decisions regarding weed control include spacing, interplanting, kinds of weeds present, and site quality. In addition, all weed control is not alike. Two years of excellent control may benefit survival and growth more than 3 years of moderate control. Although weed control practices described in this paper refer to planting on old fields, the principles are the same for cut-over forest land (Krajicek 1975). Control of herbs, grasses, and brush for several years provides for maximum growth of walnut trees.

One of the most important things you can do to increase growth of walnut trees during the first few years is to control weeds. Without weed control, plantations are likely to fail. Yet weed control is neither a cure-all nor a substitute for other management operations. By combining weed control with proper seed source selection, site selection, pruning, thinning, and pest management, maximum production in walnut plantations will be obtained.

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